The AirSticks: A New Instrument for Live Electronic Percussion within an Ensemble

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Certificate of Original Authorship

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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Abstract

This research explores the design of a new gestural instrument for electronic percussionists, the *AirSticks*. For the purposes of this work, a gestural instrument is defined as one which can, through some form of motion capture and the process of mapping on a computer, convert physical movement data into sound. The infinite ways of mapping this movement to sound is identified within as the 'mapping problem.' The aim of the research is to investigate different approaches to tackling this mapping problem within diverse collaborative musical situations to help overcome 'creative paralysis.' The method has been to use practice-based research to develop a series of mappings of the instrument for use in dozens of distinct projects which follow on from the researcher's own creative practice as a drummer and electronic producer.

Self-reflections of the researcher's role as performer/designer are provided, along with observations of working closely with a computer programmer and several expert musicians, dancers and visual artists. These reflections suggest that many different approaches are needed to tackle the mapping problem, and that laying out a clear artistic goal for a project can at least get the designer through some of this creative choice paralysis and more difficult decisions that need to be made. Considerations of how the performance may look, sound and the degree of control given to the performer leads to different mapping approaches. Mapping approaches are also influenced by whether the performance is improvised or composed, filmed or simply recorded, the size of the ensemble, the skillset of the collaborators and the genre conventions of the piece.

To enable this research, the AirSticks were designed to allow the composition, improvisation and performance of live percussive electronic music using hand and finger movements captured by gestural controllers, enabling the control of complex sound textures at the same time as allowing the performer to time and execute precise rhythmic gestures within various collaborative musical situations. A background to the field of electronic percussion in new instrument design with a focus on the use of gestural controllers is provided. The reasoning behind the choice of a particular gestural controller is discussed, as are the artistic motivations behind the project. The technical and creative components of the work, including custom software and the use of off-the-shelf controllers and sensors, are also outlined.

As part of this project, more than one hundred musical situations on the AirSticks were documented. These musical situations included live performances, films and recordings, some in solo form, but most with collaborators. Some video documentation is linked to within the thesis to help demonstrate the workings of the instrument and showcase the instrument within these projects. A detailed overview of these projects is presented along with insights into the creative and design processes. A discussion of the different 'things to consider' when designing an instrument such as the AirSticks is followed by the outlining of future projects and the design criteria of future software and hardware.

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